

# how to make your own window farm

## 3-plant airlift system

### ABOUT THE AIR LIFT WINDOW FARM:

This Window Farm is a 'mini' version of the other models that is designed to be easy to assemble for folks who want to try out a windowfarm but are not quite ready to build the structure needed for larger windowfarms. This system grows three plants and costs less than \$30. The basic configuration includes three bottles that act as plant holders, a bottom reservoir to capture/hold water, and tubing to move water through the system. It also utilizes a small air pump that uses water displacement to elevate the water up to the top of the system, where it can then trickle down through each plant.

### BEFORE BUILDING:

Check for updates on [our.windowfarms.org](http://our.windowfarms.org) and look for comments as you plan.

### MATERIALS

*Things you may have at home:*

- x3 1.5 Liter Poland Spring Eco-Shape Water Bottles
- x1 1 Gallon Poland Spring Eco-Shape Water Bottle
- String or Fishing Line
- Nail, Screw or Eyehook
- Duct Tape, Paint or Thick Fabric
- Large Zip Ties (1' long)
- Water
- x3 Plants with all dirt shaken out of roots (or seeds!)

*Sports Store:*

- x2 Air Needles - Tube/ Pump Adapters

*Hardware Store or Specialty Rubber Store( eg. Canal Rubber) :*

- x1 3/8" Outside Diameter 1/4" Inside Diameter Kuritec Reinforced
- x2 1/4" Outside Diameter 1/8" Inside Diameter vinyl Tube
- x1 3/8" Outside Diameter 1/4" Inside Diameter
- 3'6" rod or dowel
- plumber's tape (teflon)

*Hydroponic Source, such as [homeharvest.com](http://homeharvest.com):*

- x3 3" Diameter Net Cups
- x3 Tree Bark starter cubes, e.g. Root Riot brand (if you are growing plants from seed)
- 5 Liters Hydrotron Expanded Clay Pellets
- 32 oz. bottle of Hydroponic Plant Nutrients, e.g. Sugar Peak

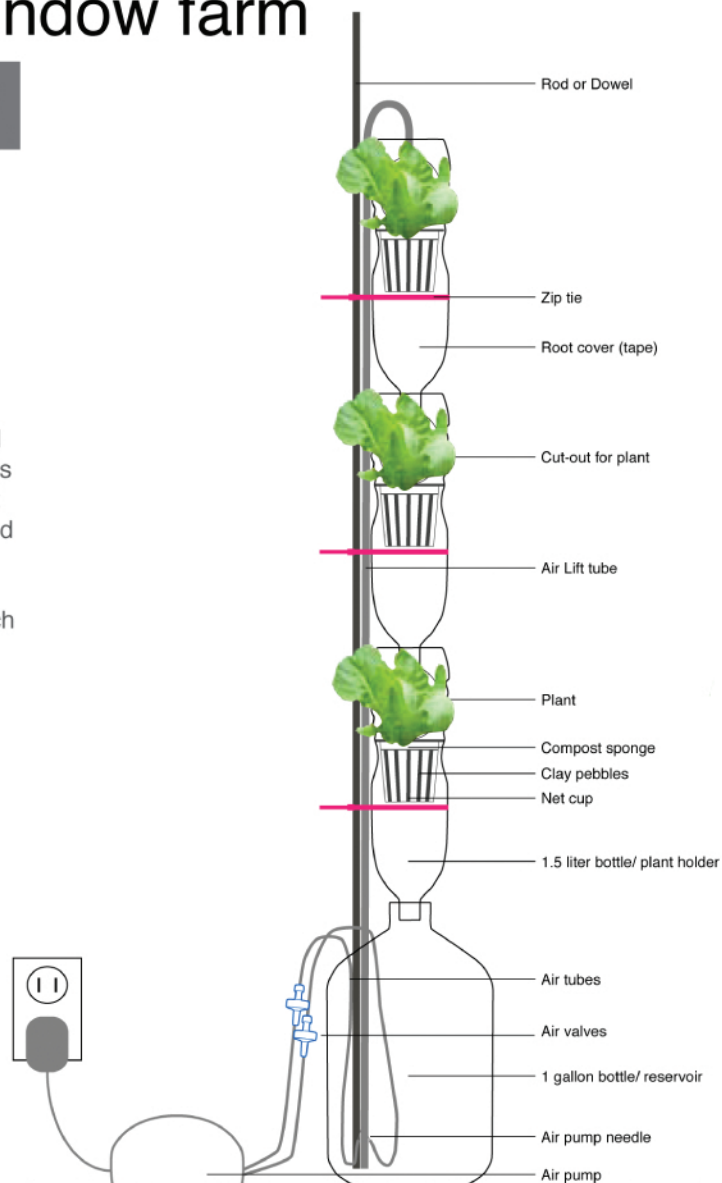
*Petco PET Store*

- Petco 2-way Air pump for 13-/106 gallon Aquariums Model 9903 (with dial) - comes with two one way air valves-if yours does not have any, buy them separately)

### TOOLS

*Craft Supply Store:*

- Scissors, Box Cutter or xActo Knife
- Paper for making stencils
- Sharpie or other felt pen



Created by Ania Wagner, Ian Hays, Britta Riley and Rebecca Bray. Inspired by Jackson Superforest.

For more information, go to

[windowfarms.org](http://windowfarms.org)



### STEP ONE:

Gather all the materials and tools you will need to make your Window Farm.

*From left to right:*

- String or fishing wire
- 1.5 Poland Spring Eco-shape bottle (3 of them)
- Duct Tape
- Masking Tape
- Air Pump
- Net Cups
- Compost Sponges
- Clay Pebbles
- Nail/ Screw
- Air needles
- Zip ties
- Utility Knife
- Shapie
- Tubes
- One-way air valves
- Plumber's teflon tape



### STEP TWO:

Using the cap of one of the 1.5 Liter bottles, begin tracing in the center on the bottom of each 1.5 Liter bottle with a sharpie. Using the sharpie line as your marker, use your xActo knife and begin cutting out the circle. Do this for each bottle.



### STEP THREE:

Print out the template provided on the last page of the PDF and trace it onto the bottom part of the bottle bellow the center. Use your xActo knife to cut out the hole for each 1.5 Liter bottle.





#### STEP FOUR:

Now we need to create an entrance for the pumping tubes in the 1 Gallon/ Reservoir Bottle. Use the cap from this bottle to trace a circle onto the top shoulder. Then cut it out with your xActo. This is the hole where the lift tube will be inserted.



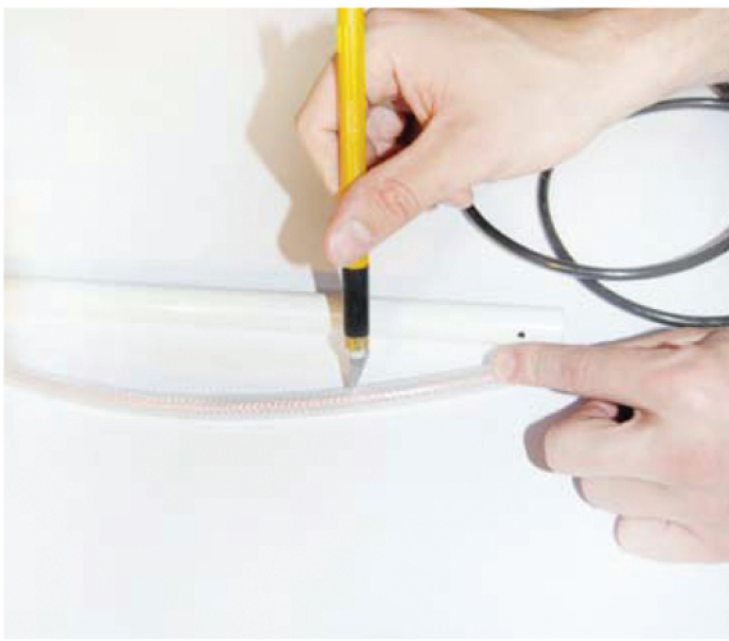
#### STEP FIVE:

The top of the bottles, which will now become the bottom, need to be covered so that the roots do not photosynthesize. You can use fabric or paint to do this, but we suggest using tape to wrap the bottle. Please look at the photo in step ten to see how high on the bottle the tape needs to go.



#### STEP SIX:

Once you have wrapped the bottle we can start to stack the bottles. Create a stack with the three bottles by nestling the mouth of of the bottle into the cut hole of the base of the next bottle. Using the long zip ties, fasten together the bottle stack, the rod, and the air lift tube (3/8" Inside Diameter Rubber Tube at 4'6" long).



## STEP SEVEN:

Now we can work on connecting the pump to the air lift tube. Make two small insertions for the needle tips 2.5" up from the bottom of the air lift tube. Place holes on opposite sides of the Airlift tube so that the pipes do not get crowded. You will insert the air pump needles into the Airlift tube in step 8.

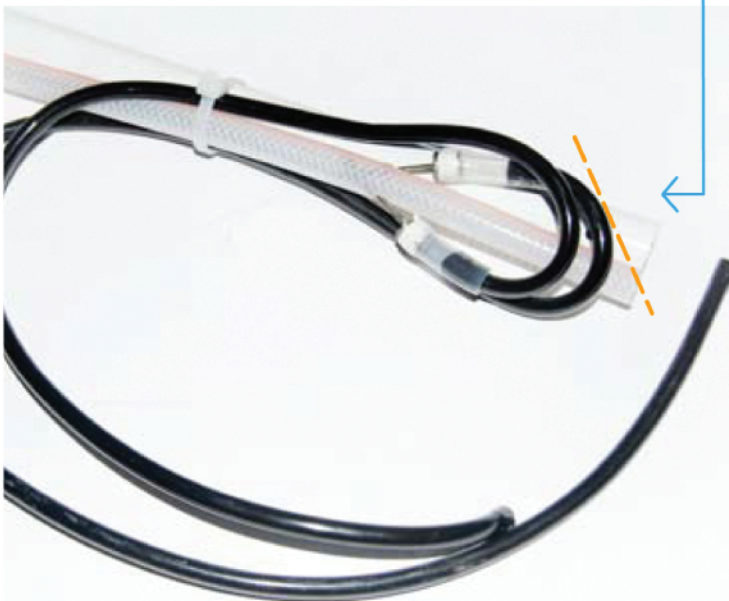
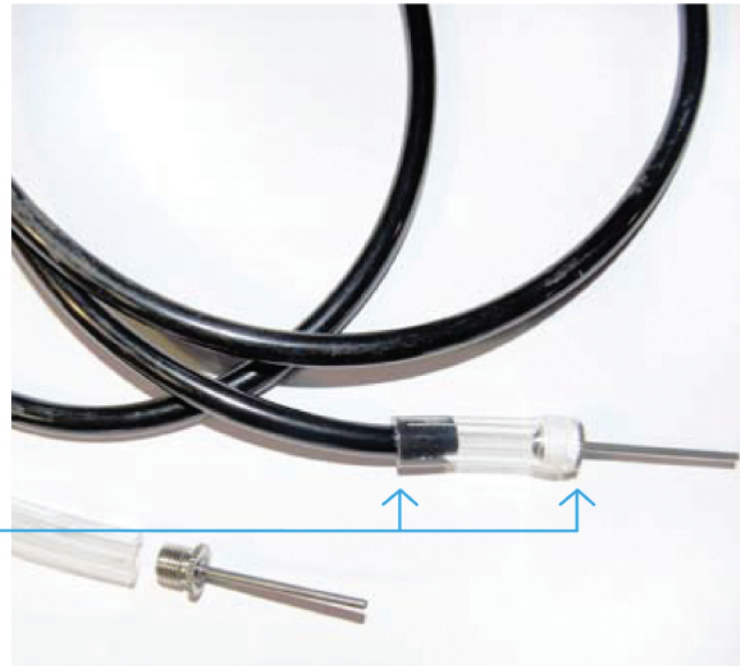
## STEP EIGHT:

Cut the adapter tubes and pump tubes to the appropriate length (see materials list). Sleeve half of the adapter tube over the end of the pump tube. Then take the air pump needles and wrap them with plumbers tape till the threading is covered and sleeve those into the open end of the adapter tubes. Insert the needles into the air lift tube and zip tie the tubes to the rod for stability.

*Note: Make sure that the mouth of the air lift tube is pointing straight down flush with the rod (see bottom right image). If the air lift tube wants to curl up, use additional zip ties to secure it to the rod, forcing it straight down. Ideally you want the whole tube to remain as straight and vertical as possible. Insert the rod with the tubing into the reservoir making sure that the mouth of the last plant holding bottle in the stack feeds into the mouth of the reservoir bottle.*

*Wrap plumber's tape securely so that no water can get in.*

*Cut this tube off at angle so it sucks in water better*

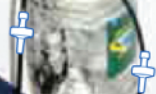




#### STEP NINE:

Next, bend the top of the air lift tube and insert it into the top of the first plant holder bottle, forming a "U" shape inside the bottle so that the end of the tube points down. Attach the air tubes to the pump. Fill the big bottle at the bottom with water to test your pump. spurts of water should be coming out of the airlift tube into the top bottle and then draining into the bottles below. Once you know that your airlift is working, you can pour nutrient solution into the reservoir.

*Note: The bottle must be filled up as high as possible or the air lift will not move. If you use a different container for your bottom reservoir make sure it is deep. Read the instructions on the bottle of the nutrients to figure out how much to add to your system.*



One way valves



#### STEP TEN:

Put Plants and Hydroton clay pellets in the net cups. You can either COMPLETELY shake out roots (to prevent dirt entering system and clogging everything) of a young adult plant that has been growing in soil, OR you can start your plants from seed in the compost sponges.

If you start plants from seed, run water without nutrients through the system for the first week. If you start with adult plants, leave the lights off for the first few days so the plants' roots will grow

better and help them recover from transplant shock. Place each plant into the opening of the plant holder bottle, turn on your pump and Viola! Adjust the bottles so that the plants are facing the light source in your window.



#### STEP ELEVEN: OPTIONAL

If you are worried about the system tipping, attach the rod to the sill of your window with a nail/ screw and string.

*Note: If there is not enough natural light source in your window, install a 100 watt "daylight" CFL bulb within 5 inches of each plant or check out [www.windowfarms.org](http://www.windowfarms.org) for ideas on how to incorporate other methods to bringing light to your urban farm.*



#### STEP TWELVE (OPTIONAL): CREATING A SILENCER

If you wish to quiet the system because of the echo from the air bubbles traveling up through the lift tube, you can add a silencer to muffle the sound. Empty a vitamin or prescription bottle that is small enough to fit into the plant holder. Using your xActo knife, poke several small holes on the bottom of the bottle so that water can pass through. Cut or drill a circular hole in the bottle cap that is the same size as the tube that curves into the top bottle. Put the tube into the silencer bottle, making sure not to harm the plant.

Template for Side Holes  
(cut around the line)